federal register

WEDNESDAY, JANUARY 17, 1979
PART III

# FEDERAL COMMUNICATIONS COMMISSION

■

# IMPROVEMENTS TO UHF TELEVISION RECEPTION; TELEVISION RECEIVER PERFORMANCE STANDARDS; AND TECHNICAL IMPROVEMENTS TO TELEVISION RECEIVERS AND CERTAIN TRANSMITTER STANDARDS

[6712-01-M]

## FEDERAL COMMUNICATIONS COMMISSION

[47 CFR Part 15]

[General Docket No. 78-391; FCC 78-864]

### IMPROVEMENTS TO UHF TELEVISION RECEPTION

#### Inquiry

AGENCY: Federal Communications Commission.

ACTION: Notice of Inquiry.

SUMMARY: The FCC is soliciting the public for comments on Improvements to UHF Television Reception in both the technical and consumer areas. This information is needed to form the basis upon which action may be taken to improve UHF reception.

DATES: Comments must be received on or before April 2, 1979. A date for reply comments will be set after the initial comments have been summarized.

ADDRESSES: Federal Communications Commission, 1919 M St., NW., Washington, D.C. 20554.

FOR FURTHER INFORMATION CONTACT:

Philip Gieseler or Virginia Armstrong, Office of Plans and Policy, (202) 634-7651.

In the matter of improvements to UHF television reception, GEN Docket No. 78-391.

Adopted: December 20, 1978.

Released: December 29, 1978.

### INTRODUCTION

1. The Federal Communications Commission (FCC) is instituting this Inquiry as part of a process to determine how UHF (ultra-high frequency—channels 14-83) television reception can be improved relative to VHF (very high frequency—channels 2-13) television reception. Prompted at this time by a recent Congressional mandate, we are initiating this Inquiry and convening a UHF Comparability Task Force to analyze the many possibilities for improved UHF service.[1] In this Notice, we reaffirm our commitment to a fully viable and competitive UHF service; we ask questions of the public and interested parties that will aid in our deliberations; and we present an initial plan for the work of the UHF Comparability Task Force.

2. We view parity not as an end in itself, but as a means for accomplishing other goals such as increasing the number of UHF station viewers and their level of satisfaction. Larger UHF audiences should cause revenues and profits of existing UHF stations to increase, encouraging the establishment of additional new UHF stations. Higher profits and more stations on the air should ultimately increase the number, quality and diversity of television programs available to viewers, while encouraging other goals such as local programming, and minority ownership and operation of television stations. At the same time, we are aware that any requirements to improve the technical quality of UHF reception may increase the cost of manufacturing antennas and receivers, a cost which will ultimately be borne by the consumers who purchase those items.

3. The process, in which this Inquiry is the first step, will determine which of several approaches for improving UHF television will best serve the consumer and the overall public interest, by analyzing the costs and benefits of particular improvements. Initially, we are concentrating on gathering together in one Docket all existing information on UHF reception. This information will be updated and analyzed for any gaps. Solutions require accurately knowng the components of a problem, so our emphasis will first be on compiling data that define the problem, and then seeking solutions.

4. To encourage wide participation and debate in this proceeding, and to produce a detailed record for Commission review, the Task Force will issue periodic reports. Interested persons will then have the opportunity to submit relevant comments. All comments will be analyzed for a final report to the Commission. The final report of the UHF Comparability Task Force will take into account all comments received, consistent with a timetable for Task Force recommendations within the next two years.

### HISTORICAL BACKGROUND

5. Allocations for television spectrum space were first made in 1941 in the VHF frequency band (channels 2-13).[2] By 1945, however, it became apparent that those 12 channels could not adequately meet the demand. Thus, in order to achieve a competitive nationwide television system, the FCC sought to create additional channels on the readily available frequencies of the UHF band.

6. With the publication of its *Sixth Report and Order on Television Allocation* in 1952, the Federal Communications Commission fully committed itself to UHF television.[3] It believed that allocating channels 14-83 for television broadcasting would help maximize the television audience.[4] It expected UHF to prosper because the 12 VHF channels were too few to meet the public's needs; VHF was not thought to be sufficiently mature to put UHF at a great disadvantage; and differences in wave propagation were not thought to be serious enough to affect competition. Scientific advances, when coupled with these market incentives, were expected to create a technologically improved UHF system. The FCC at that time believed television would eventually shift to the higher frequency band (channels 14-83).[5]

7. When the UHF television band became available for commercial use in 1952, VHF was already well-established with 108 stations reaching two-thirds of the nation's population.[6] Stations broadcasting on UHF thus faced widespread competition from intrinsically superior VHF facilities. Furthermore, few television sets were equipped to receive the UHF signals.

8. Due to the physical characteristics of wave propagation as a function of frequency, UHF signal strength declines more rapidly with distance than does VHF signal strength. In addition, terrain variations and high buildings are more likely to affect the higher frequency UHF signals. These competitive and technical disadvantages, collectively known as the "UHF Handicap," substantially hindered further development of UHF television, and this hindrance was circular. With smaller audiences being reached through UHF, advertisers and networks preferred VHF. And without sources of major network programming and advertising revenues for improving transmission facilities, UHF stations could not induce a large segment of the population to purchase receivers equipped for channels 14-83. The UHF disadvantage is still evident today when rating comparisons are made between UHF and VHF stations—even between UHF and VHF

---

[1] Congress approved a $750,000 appropriation and created five staff positions to examine comparability for UHF and VHF television. Public Law No. 95-431 92 Stat 1040 (October 10, 1978), *Appropriations for Departments of State, Justice, Commerce, Judiciary and related agencies.* See also Senate Report 95-1043, 95th Cong. 2nd Sess. (July 28, 1978). (Paragraph 14 of this *Notice* includes specific language contained in the Senate Report.)

[2] Channel 1 was reallocated to land mobile radio in 1944. See FCC *Allocations of Frequencies to Non-governmental Services,* 9 FR 10270 (1944).

[3] Docket Nos. 8736, 8975-6 and 9175, 1 Radio Regulation (RR) 601, 607, 660 ff (1952).

[4] Channels 70-83 were reallocated to land mobile radio in 1970, although some television translator stations (low-power rebroadcast devices) still operate in this band on a secondary basis. See *Report and Order* in Docket 18262, 23 FCC 2d 325, 19 RR 1663 (1970).

[5] 11 FCC Annual Report 21-22 (1946).

[6] See H. Plotkin, *TV Networks and the UHF Problems,* report prepared for the Senate Committee on Interstate and Foreign Commerce, 85th Cong. Sess. 1. (1955).

network affiliates where the programming differences are minimal.[7]

9. The number of UHF stations increased from 45 in 1953 to 137 in 1954, but decreased to only 108 in 1955.[8] In 1955, the FCC acknowledged that UHF still lacked a substantial audience and was concerned about UHF's no-growth situation. In response to these problems, the FCC proposed a policy of deintermixture (FCC allocation of only UHF or only VHF channels in a given market).[9] This policy was expected to eventually shift the country to primary use of the UHF band. However, the Commission never established a deadline for conversion of some markets to UHF-only markets. As a result, the public was left with no incentive to purchase all-channel receivers, and industry with no incentive to manufacture them. When Congress began formulating the *All-Channel Television Receiver Act of 1962* (the Act), the Commission issued a *Report and Order Terminating the Eight Captioned Deintermixture Proceedings.* The FCC decided that deintermixture was not in keeping with either the Act, or the Commission's policy of seeking "a system of using both UHF and VHF channels" as the best way to reach a "general or long-range solution for the television allocations problem."[10] By 1962 there were only 104 UHF stations nationwide and it was estimated that only 8.35% of the 3.3 million receivers produced in the first half of that year were equipped to receive all channels.[11]

10. The *All-Channel Television Receiver Act of 1962* stipulated that all television sets shipped in interstate commerce after April, 1964, had to be adequately equipped to receive channels 14-83.[12] It permitted the FCC to regulate television receivers with respect to UHF reception: the Commission subsequently set a maximum 18 dB noise figure for the UHF portion of a set.[13] In 1978, the Commission again voted to reduce this maximum noise figure to 14 dB, effective by October 1979, and to 12 dB by 1982.[14]

11. In implementing the *All-Channel Television Receiver Act,* the Commission called for adequate but not necessarily comparable UHF reception, believing that adequacy was sufficient to solve the "root problem" behind the UHF disadvantage: inability of consumers to receive UHF stations.[15] It also believed implementation of the Act would

> lead to research efforts by the manufacturers, which it is hoped, will greatly improve the UHF portion of the receiver. Our conferences with industry representatives have indicated that such research and improvement will be undertaken without delay and in a vigorous fashion.

As in the past, the Commission felt that

> With increased use of UHF, and increased incentive for both equipment manufacturers and station operators to exploit its maximum potential, there is reason to believe that several of the problems which presently restrict coverage of UHF stations would be overcome.[16]

12. By August 1965, an estimated 33% of the nation's households owned all-channel receivers, and the figure increased to 42.1% in 1967.[17] The next year, the Commission mandated that all sets have comparable ease of tuning for both UHF and VHF portions of the receiver. This regulation would eliminate the "built-in UHF deterrent in the form of separate, different and more complicated UHF tuning system."[18] It would apply to all sets measuring at least 9" diagonally manufactured after April, 1971, and to all television sets after April, 1975. The Commission considered a six-position UHF click-stop tuner sufficient to meet this requirement, although in 1976 it required a 70-detent ("click-stop") tuner equipped with automatic frequency control (AFC) on all sets manufactured after June, 1977.[19]

13. In 1976, the Commission further acted to improve the allowable tuner accuracy to +2 MHz.[20] It also required that all sets with a manufacturer-supplied VHF antenna must have a similarly supplied UHF antenna, and if one was permanently affixed to the set, the other must also be affixed.[21] In 1976, 92% of the nation's households with television owned all-channel receivers.[22]

14. In 1978, Congress found that "the intent of the *All-Channel Receiver Act of 1962* has not been realized. UHF television broadcasting remains sorely disadvantaged within the national television system. The [Senate] Committee [on Appropriations] directs that the Commission devise a plan for UHF to reach comparability with VHF in as short a time as practicable. * * * This plan should address all the technical and regulatory aspects of achieving parity and should set a schedule for dealing with each, including dates for achieving specific goals, such as noise level reductions. It should also include indications of the probable need for any legislation necessary to fulfill the plan."[23] Accordingly, we are issuing this Inquiry and have formed the UHF Comparability Task Force to address the fundamental technical differences between UHF and VHF reception and to propose and consider methods for minimizing those differences.

### Consumer Issues

15. A fundamental assumption in this Inquiry is that viewers consider the technical aspects of UHF reception to be inferior to VHF reception. A second assumption is that UHF viewer satisfaction would rise and the audience for UHF programs would increase if UHF picture quality were judged equal to VHF quality.[24]

16. Thus, the first set of questions to which we seek answers are these:

A. Do consumers perceive UHF picture and sound quality to be significantly lower than VHF quality?

B. Assuming that viewers do perceive a difference in the technical quality of UHF and VHF signals, what differences are the most bothersome:

(1) Multiple images or ghosts?

(2) Snow or other indications of a weak signal?

(3) Pictures which do not stay locked in position but roll or slide?

(4) Color pictures with unnatural colors or bleeding of colors?

(5) Poor quality sound?

(6) Interference which causes lines or blanks out the picture?

---

[7] See R. E. Park, "Potential Impact of Cable Growth on Television Broadcasting" (Rand Corporation Report R-587-FF), October 1970, Chapter III. The preliminary results from an updated study being done by Park for the FCC with more recent data confirm that there is still a substantial handicap for UHF network affiliates even during primetime.

[8] 19 Annual Report 93 (1953), 20 Annual Report 89 (1954), 21 Annual Report 95 (1955).

[9] Dockets Nos. 11238 and 11333-6, 13 RR 1511 (1955).

[10] Docket Nos. 14239-46, 23 RR 1645 (1962).

[11] 28 FCC Annual Report 58, (1962).

[12] Pub. L. 87-529, enacted July 10, 1962. 76 Stat 150; 47 U.S.C. 303(s) and 330.

[13] Noise figure refers to the amount of "snow" (a kind of visual interference) added by receiving components to the television picture. A lower noise figure will mean less "snow" for a large number of viewers in areas where the signal is weak.

[14] *Report and Order* in Docket No. 21010, FCC 78-582, 43 FR 36096 (August 15, 1978).

[15] Docket No. 14796, FCC 62-631, 1192 in 27 FR 9923, 11698.

[16] Docket Nos. 14239-46, 23 RR 1645 (1962).

[17] FCC 33 Annual Report 38 (1967).

[18] See *Notice of Proposed Rule Making,* FCC 69-88, 18 RR 2d 1577 (1968); also *Report and Order* Docket No. 18433, FCC 70-113, 21 FCC 2d 245 (1970).

[19] See Docket No. 20719 FCC 76-1063, 39 RR 2d 89 (1976); also *Notice of Proposed Rulemaking* FCC 76-138, 58 FCC 2d 338 (1976).

[20] See *Report and Order* in Docket No. 20839, FCC 76-1146, 42 FR 1231 (1977).

[21] *Ibid.*

[22] *TV Factbook,* 1978, at 98-101a.

[23] Senate Report 95-1043, 95th Cong., 2nd Sess. (July 28, 1978).

[24] Some studies indicate a cultural bias against UHF. See for example K. White, "Television Market Shares, Station Characteristics and Viewer Choice," *Communication Research,* Vol. 4, No. 4, October 1977. Such a "psychological" handicap, if it exists, could be inhibiting the development of UHF even if performance is equal to that of VHF.

(7) Other problems?

C. How much would consumers be willing to pay to improve the picture and sound quality of UHF?

D. Do consumers have the knowledge to install and adjust their sets correctly?

E. Do consumers finds it more difficult to adjust their sets for UHF programs than for VHF programs?

F. Is informational material on installation and adjustment of sets available to the public, and written in such a way that it is understandable?

G. Does the existence of the two-dial (rotary) tuning system affect viewer choice of UHF or VHF signals? For push-button tuning, do full random access (digital) tuners afford more comparability in channel selection than preset memory tuners?

H. Has cable TV affected viewers choice of UHF or VHF programs? How?

I. What information about improving UHF reception would consumers find most useful, and in what form (brochures, public service announcements, etc.)?

J. Would consumers prefer:

(1) More information made easily available on how to compare, select, install and adjust equipment for UHF reception?

(2) Mandated labels on TV receivers, UHF antennas and lead in which would make it easier to compare reception capability?

(3) Higher technical standards required of manufacturers of TV receivers, UHF antennas and antenna lead-in?

K. As none of these changes will be costless, at what price would consumers choose one alternative over another? As an example, if it would cost $5 to provide more information to consumers, $10 to implement mandatory labeling, and $20 to institute mandatory standards, which alternative would consumers prefer?

L. What is the relative contribution of picture quality and ease of tuning to the UHF Handicap?

M. If UHF picture and sound quality were equal to that of VHF, by how much would the audience for UHF television increase?

N. What uses and services, other than over the air reception, do viewers expect of UHF TV in the future? How will this affect our study?

17. The second aspect of consumer participation involves providing information that will help implement better receiving systems. The purchase and proper installation of television receiving equipment—TV sets, antennas, and lead-in (such as coaxial cable and twin lead)—is largely the consumer's responsibility. Yet it appears that the receiving components, particularly antennas and lead-in, are major determinants of UHF/VHF reception problems. We hope to ascertain whether and to what degree UHF reception would benefit if various improvements were made and to pass this information on to the public in the most effective manner. Possibilities for disseminating this data include a consumer information program, and grading or labeling of receiving equipment for adequate UHF reception. The UHF Comparability Task Force will develop information concerned with providing useful information to the consumer.[25]

TECHNICAL ISSUES

18. TV reception is a function of both the transmitting and receiving equipment. Therefore, improvements in reception may be achieved by changing many different components. The following technical areas will be examined on the basis of the costs of improvements versus the benefits obtained. We are interested in costs to viewers, stations, manufacturers and the Commission. Similarly, we are interested in measuring and comparing the benefits to each of these groups. Therefore, the UHF Comparability Task Force will be evaluating improvements in the following areas:

A. Increased transmitter power [26]

B. Improved transmitting antennas (increased gain and better coverage)

C. Increased transmitter antenna height

D. Circular polarization [27]

E. Better outdoor receiving antennas

F. Better indoor receiving antennas

G. Better built-in receiving antennas

H. Lower-loss lead-in

I. External low-noise UHF amplifiers

J. Receiving antenna coaxial connector on TV sets

K. Better installation of receiving equipment

L. More usable UHF channel selection mechanism [28]

M. Other technical improvement to UHF television reception and transmission [29]

19. At this time we particularly seek the following information concerning the above improvements:

A. When a commercial UHF station increases its service coverage by increasing transmitter power, improving transmitting antenna gain and/or increasing transmitting antenna height, do sufficient increased advertising revenues result such that the upgraded facilities are economically worthwhile?

B. Could UHF reception be improved by changes in the transmitting antenna location? Do reception problems exist when a UHF station in a market transmits from a different location than VHF stations? What, if any, improvement is available from locating transmitters in the same vicinity?

C. What, if any, technical or economic impediments are inhibiting the introduction of higher efficiency transmitting equipment (e.g. klystron tubes) into the marketplace?

D. Do the benefits of circular polarization adequately compensate for the requirement (assuming the same service area) for additional transmitter power that results because both a horizontally and vertically polarized transmitting component are required?

E. Under what circumstances would a viewer receive adequate VHF reception using an indoor receiving antenna, but would require an outdoor UHF antenna for comparable reception on UHF?

F. What is the difference in antenna gain for the UHF and VHF antennas that come with television sets when purchased?

G. As distance from the transmitter increases, what is the relative proportion of built-in antennas, indoor antennas, outdoor antennas, antennas with preamplifiers, and master antenna systems?

H. What receiver gain or other guidelines could be formulated for adequate UHF reception for various environments? How do these guidelines compare with VHF?

I. What improvements exist for the antenna lead-in? Could losses due to

---

[25] Consumer information will also be developed for use in a separate FCC proceeding concerning labeling and grading. See *Notice of Inquiry* in Docket 78-307, *Television Receiver Equipment Grading*, 43 FR 49550 (October 24, 1978).

[26] Most UHF stations operate well below the maximum power allowed in § 73.614 of the FCC rules, 47 U.S.C. 73.614.

[27] We plan in part to evaluate information contained in a previous FCC proceeding concerning circular polarization. (See *Report and Order* Docket No. 20802, *Amendment of Subpart E, Part 73 of the Commission Rules and Regulations to permit television broadcast stations to employ circular or elliptical polarization*, adopted April 6, 1977, released April 14, 1977, FCC 77-259.)

[28] A narrower version of this question was previously addressed in Docket 21179 (*UHF Channel Readout on Television Receivers*). The comments received in that Docket have convinced us that this issue should be pursued in the broader, more comprehensive framework provided by this Inquiry and the concurrent proceeding *Technical Improvements to Television Receivers and Certain Transmission Standards*, General Docket 78-392; FCC 78-866, elsewhere in Part III of this issue. Consequently, we have today terminated the Channel Readout Docket (Order adopted December 20, 1978, released December 29, 1978, FCC 78-865) and have incorporated the record of that Docket into the record of this Docket.

[29] In this Inquiry we will evaluate components from the transmitting system up to the television receiver. In a related proceeding being adopted today, changes internal to TV receivers will be considered (including consideration of UHF interference susceptibility and receiver noise figure). See *Notice of Inquiry* in General Docket 78-392, *Technical Improvements to Television Receivers and Certain Transmission Standards*, FCC 78-866, elsewhere in Part III of this issue.

impedance mismatching of antenna, lead-in and receivers, or the losses that may exist in impedance-matching transformers (baluns) be economically eliminated if all components were of the same impedance?

J. What improvement is obtainable from use of a coaxial connector rather than screw terminals for attaching the receiving antenna onto the set, and at what cost? What is the present availability of receivers specifically intended to accommodate coaxial cable?

K. What economical designs exist for external low-noise, linear UHF amplifiers? How much would use of such amplifiers improve UHF reception? What, if any, undesirable effects could result?

L. What improvement is obtainable if receiving equipment is simply installed more carefully?

20. The propagation of UHF and VHF signals through space are based on fixed laws of physics, but understanding the difference between UHF and VHF propagation will enable a fuller understanding of the degree of the UHF Handicap. We seek the following information:

A. For the limited purpose of differentiating between UHF and VHF coverage, is there a propagation model or set of assumptions that would produce an accurate comparision of signal strength:

(i) In highly reflective environments?

(ii) Within buildings?

(iii) Due to hilly or mountains terrain?

(iv) Due to foliage?

B. Present FCC planning factors have a differential value of 17 dB between the field strength of lower VHF signals and UHF signals.[30] This differential is assumed to produce a statistically acceptable picture at the Grade B contour.[31] That is, the planning factors indicate that the UHF signal must be 17 dB stronger than the VHF signal to produce the same quality picture. At the Grade A contour the similar differential is 6 dB. Are these differentials valid for current receiving equipment?

21. The Commission will gather materials for this proceeding through its UHF Comparability Task Force, which will evaluate comments submitted by the public, study existing literature, conduct analyses, and initiate research contracts. In evaluating the cost versus benefit of improvements to UHF reception, the Task Force will develop information for a wide range of criteria, such as:

A. Technical feasibility of the improvement.

B. Increased viewer satisfaction.

C. Effect on immediate and long term licensee viability.

D. Cost to the manufacturer and consumer.

E. Impact on the ability to efficiently utilize the radio spectrum.

F. Impact on rate of innovation.

G. Cost of administering an improvement to the FCC or to other government agencies.

### Related Commission Actions

22. Additionally, the FCC has underway other Inquiries that could directly or indirectly address UHF television service. For instance:

A. The Commission, in a companion Inquiry, is determining whether the use of new receiver designs could improve the spectral utilization and overall performance of television. See *Notice of Inquiry*, in General Docket 78-392 *Technical Improvements to Television Receivers and Certain Transmission Standards*, FCC 78-866, elsewhere in Part III of this issue.

B. The Commission is reducing the maximum UHF noise figure to 14 dB by 1979, 12 dB by 1982, and will be evaluating whether further reductions in noise figure should be made. See *Report and Order* in Docket 21010, *UHF Television Receiver Noise Figures*, FCC 78-582, 43 FR 36095 (August 15, 1978).

C. The public could be provided with more information that would assist in the choice of television receiving equipment through a program of grading and labeling television reception equipment. See *Notice of Inquiry* in General Docket 78-307, *Television Receiver Equipment Grading*, FCC 78-665, 43 FR 49550 (October 24, 1978).

D. The study of networks might point to regulatory changes that in turn might lead to new networks that would include many UHF stations. (See paragraph 46 of the *Further Notice of Inquiry* in Docket 21049, *Commercial Television Network Practices*, FCC 78-736, 43 FR 50126 (October 26, 1978).

E. Fees for use of the spectrum could be based on the value of the particular spectrum used. (See *Notice of Inquiry* in General Docket 78-316, adopted September 27, 1978 released October 6, 1978, FCC 78-695, and HR 13015, 95th Cong. 2d Sess. (1978), the proposed Communications Act of 1978, 43 FR 46658 (October 10, 1978).) Should such a fee system ever be passed by Congress, the fee difference between UHF and VHF could eliminate the cost handicap facing UHF.[32]

23. The Task Force will maintain close contact with the proceedings listed above and any others that are instituted during its work. For instance, some evidence indicates that a tradeoff may exist between a receiver's interference rejection and its adequate reception of weak signals.[33] Coordination among proceedings will enable a better determination of whether benefits in fact tend to oppose one another due to technological limits, and, if so, the most appropriate reconciliation.

### Task Force Plan of Action

24. The Task Force will initially seek to isolate the degree and causes of the UHF Handicap. Though opinions are strong concerning UHF Television, they do not agree on what the problems are and how to correct them. In determining the true problems with the UHF service, we hope to lay a foundation that will guide implementation of the most beneficial improvements.

25. The Task Force will work to identify the scope of particular problems. Is a snowy picture experienced in rural, suburban and urban areas, or just in rural areas well removed from the transmitter? Should we focus our attention on improved outdoor receiving antennas, or will most viewers rely on indoor antennas? Wide ranging solutions are required for broad-based problems; but such solutions could be counterproductive if applied to localized problems, since they would administer a cure to everyone for a problem experienced only by a few. Thus determining the nature and degree of the problem is of utmost importance. Assuming we know what the problem is before studying it may not produce cost-effective solutions.

26. The ultimate goal of an improved UHF service is increased public satis-

---

[30] See, for example, *A Review of the Technical Planning Factors for VHF Television Service*, Gary S. Kalagian, FCC/OCE RS 77-01 (1977), NTIS PB 266341. A similar report for UHF planning factors is in preparation. See also § 73.683 of the FCC Rules, 47 U.S.C. 73.683.

[31] The Grade B and Grade A contours are used in determining the approximate service area of a television station, by employing an engineering model of how radio waves propagate through the atmosphere. Due to a myriad of natural factors such as weather, terrain and foliage, actual service may be quite different from that predicted by the FCC model.

[32] Additional inquiries that could aid the implementation of television improvements are: *Notice of Inquiry* in General Docket 78-348, *Measurement Techniques of Television Receiver Noise Figures*, FCC 78-737, 43 FR 51560 (November 6, 1978). This Inquiry will explore the definition of Noise Figure, methods for its measurements, and other related technical issues. *Notice of Inquiry, Television Receiver Performance Standards*, adopted December 20, 1978, FCC 78-866, elsewhere in Part III of this issue. This Inquiry will explore performance standards to use in conjunction with noise figure to insure overall television adequacy, and new measures of weak signal performance to supersede noise figure.

[33] *Relationship Between Noise Figures and Other Performance Characteristics of Contemporary UHF-TV Receivers*, L. C. Middlekamp et al, FCC/OCE LAB 78-02 (May 1978).

faction. But how can television viewers best be served? Are they in fact satisfied with present UHF television? If not, what are their specific complaints? How large are particular problems? The Task Force will undertake a consumer survey to determine the major problems with UHF reception, from the consumer's point of view. Concurrently, a technical study will be initiated to analytically evaluate UHF performance relative to VHF.

27. In determining the relative contribution of each component of the transmission/reception system, existing information will be compiled and analyzed, and, where appropriate, additional research will be undertaken. The following areas will be evaluated:

*Receiver performance.* Using a cross section of modern television receivers, the additional UHF signal strength needed to produce the same quality signal displayed on VHF channels will be determined. This should show the state of the existing television receivers concerning UHF/VHF performance.

*Receiving antenna gain.* A cross section of indoor and outdoor receiving antennas will be evaluated under laboratory conditions to determine gain and directivity. The uniformity of antenna gain across the UHF band will be evaluated. It is hoped that this analysis will reveal optimum receiving antenna designs, develop figures of merit to describe antenna performance, and help specify what antennas are desirable at varied distances from the transmitter.

*Transmission line.* The performance and uniformity of performance of twin-lead, coaxial cable, and matching transformers will be evaluated. Problems due to the need to match the impedances of the receiving antenna, transmission line and receiver will be determined.

*Receiving system.* A sample of actual receiving antenna/transmission line systems will be evaluated to determine the system gain or loss. This will reveal actual rather than laboratory performance, and will indicate the effects of aging, damaged components, and antenna/transmission line connections.

*Propagation.* Understanding the differences in radio propagation between UHF and VHF is needed in order to precisely define the UHF Handicap. We would like to formulate a limited purpose propagation model that will predict statistical differences in UHF/VHF picture quality, including effect within buildings, in dense urban areas, and due to mountainous terrain.

*Transmission systems.* Statistics will be compiled on the effective radiated power (ERP) of commercial and noncommercial UHF stations, and trends toward increased ERP.

*Channel selection systems.* We wish to determine the effect that present tuning systems have on viewer selection of VHF or UHF channels. A study will show the effect, if any, of the separate dial UHF/VHF tuning system on UHF viewership, and compare this result with other channel selection systems such as electronic tuning. Marketing trends toward new channel selection systems will be determined.

28. Understanding the components of the UHF Handicap will require several months of staff effort, and will yield important benefits.[34] It will enable subsequent work to be based on concrete data rather than assumption or opinion. The importance of the problem, and therefore the needed solution, will be determined. The most logical improvements will be known, and initial ideas about how best to implement the various improvements will become clear.

29. Completion of this work will represent the conclusion of the first part of the following three part program:

1. *Determination* of the nature and components of the UHF Handicap;

2. *Evaluation* of specific improvments and methods for implementation; and

3. *Formulation* of alternatives for correcting the deficiencies with UHF.

30. The possibilities for improvement to be considered in the second (evaluation) phase of the program are given in Paragraph 18 of this Notice. In keeping with a desire to avoid predisposition towards any solution or set of solutions, particular improvements to receive major consideration will not be specified until full information is obtained from phase one. It is the Task Force's intention to issue an interim report at a later date that will present conclusions resulting from this phase of its work, and it will present an outline of further work to be undertaken at that time.

INFORMATION ON COMMENTS

31. *Who should file comments?* We urge the viewing public, television equipment manufacturers, broadcasters, and all other interested parties to participate in this Inquiry. You may participate by sending information and opinions that are relevant to the questions listed in this Inquiry.

32. *How will this information be used?* The comments we receive will be used to evaluate the issues we have discussed above. Comments may result in FCC action to improve UHF television service. For example, we might change the FCC rules to specify additional requirements for television receiver certification. The FCC will make rule changes only after all interested parties are given an adequate opportunity to comment.

33. *How comments should be prepared.* Your comments must clearly show this docket number "Gen Docket No. 78-391, at the top of the first page. Please label your responses so that it will be clear which number paragraph and question is being answered. If your comments are general, and not related to a specific question, please state the issue being addressed.

34. *How many copies should be sent?* Sec. 1.419 of the rules requires that you file the original and five copies of your comments. If you want each Commissioner to receive a personal copy of your comments, you should include 6 additional copies. The FCC will fully consider all comments, even if only the original is filed.

35. *Where to send comments.* Send your comments to: Secretary, Federal Communications Commission, Washington, D.C. 20554.

36. *How to see the comments of other parties.* All comments will be available for public inspection in the FCC Dockets Reference Room, Room, 239, 1919 M St., N.W., Washington, D.C. The FCC is open weekdays between 8:00 am and 5:30 pm. You can reply to comments submitted by another party by following the same procedure as you do for commenting.

37. *Deadline for filing Comments.* Comments must be received by April 2, 1979. You are encouraged to submit a one-page summary of your comments at the time you file. A date for replies to comments will be set after the initial comments have been summarized.

38. The source of our legal authority. Section 4(i), 302, 303(f), (g), (r), and (s), 330, and 403 of the Communications Act gives the FCC the authority to conduct this Inquiry. Accordingly, the FCC orders that this Inquiry is instituted.

FEDERAL COMMUNICATIONS COMMISSION,
WILLIAM J. TRICARICO,
*Secretary.*

[FR Doc. 79-1503; Filed 1-16-79; 8:45 am]

[34] Initial estimates are that from 4 to 6 months will be required to undertake the first phase of the UHF improvement program.

---

[6712-01-M]

[47 CFR Part 15]

[Docket No. 21179; FCC 78-865]

## UHF CHANNEL READOUT ON TELEVISION RECEIVERS

### Termination of Proceeding

AGENCY: Federal Communications Commission.

ACTION: Termination of proceeding without action and merger of the

record into a general inquiry into UHF television reception.

SUMMARY: This proceeding has been concerned with the improvement of the UHF channel display on television receivers. Because a new, broader inquiry into UHF television reception includes the possibility of requiring electronic tuning and because electronic tuning would eliminate any and all UHF channel display problems, this proceeding is being terminated. Channel display issues will be considered with other broader questions concerning UHF television reception in a new proceeding.

EFFECTIVE DATE: Non-Applicable.

ADDRESSES: Federal Communications Commission, Washington, D.C. 20554.

FOR FURTHER INFORMATION CONTACT:

Upton Guthery, Office of General Counsel, (202) 632-6444.

Adopted: December 20, 1978.

Released: December 29, 1978.

*Order.* In the matter of UHF Channel Readout On Television Receivers, Docket No. 21179.[1]

1. A *Notice of Inquiry* in this proceeding was released on March 25, 1977 (FCC 77-221, 42 FR 18643, April 8, 1877). In the *Notice*, we explained that comments in an earlier proceeding (Docket No. 20719) had raised a number of legitimate questions concerning the UHF channel readout on television receivers. Those comments were addressed to receivers equipped with a 70-position electromechanical UHF tuning system in which the channel numbers are displayed on the face of the tuning knob. The substance of the comments was summarized as follows:

> First the complaint is that our rules permit only every other channel number to be displayed with marks between numbers to indicate the channels not displayed numerically (*see* § 15.68(d)(1)). Secondly, it is complained that the numbers are small in size and closely spaced, so that it is difficult to determine what channel has been tuned. Third, it is said that superior on-the-knob channel displays are available for minimal additional cost.

Comments and reply comments in this proceeding were filed in August 1977. On the basis of these comments, we have been able to conclude that the channel displays in question are significantly inferior to VHF displays, that UHF tuning is therefore somewhat more difficult, and that some percentage of the viewing public will, in all likelihood, be disinclined to tune UHF stations. However, we have not been able to determine the numbers of UHF viewers lost because of tuning difficulty or whether the number is significant. Nor have we been able to determine that the alternative device is (or is not) mechanically sound or, if mechanicallly sound, and considering its disadvantages as well as advantages, whether its use would contribute to UHF TV viewing. The comments pro and con are, in this respect, irreconcilable.

2. We are today issuing two *Notices of Inquiry* that, together, will provide a more comprehensive framework for investigation of the question of UHF channel readout. In *Improvements to UHF Television Reception*, (Gen. Docket No. 78-391, FCC 78-864), we will study the effect of UHF channel readout on UHF viewing. In *Technical Improvements to Television Receivers and Certain Transmission Standards* (Gen. Docket No. 78-392, FCC 78-866), we will explore the possibility of requiring electronic tuning. If such a requirement were imposed, it would eliminate any and all present differences between UHF and VHF channel readout and would moot the issues under consideration in this proceeding.

3. We are therefore terminating this proceeding. The record herein will be made a part of the record in General Docket Nos. 78-391 and 78-392. Further comment concerning the display of UHF channels and tuning difficulty may be submitted in either or both of these proceedings. If they are not otherwise resolved (e.g., by requiring electronic tuning), the issues in this proceeding will be addressed in greater detail in those proceedings.

4. *Accordingly, it is ordered*, Effective February 12, 1979, that the instant proceeding is hereby terminated as a separate inquiry, and the comments and reply comments of the instant proceeding are made part of the inquiries in Gen. Docket No. 78-391 and Gen. Docket No. 78-392.

FEDERAL COMMUNICATIONS COMMISSION,
WILLIAM J. TRICARICO,
*Secretary.*

[FR Doc. 79-1504 Filed 1-16-79; 8:45 am]

[1] See 42 FR 32567, June 27, 1977.

---

[6712-01-M]

[47 CFR PART 15]

[Gen. Docket No. 78-393; FCC 78-868]

## TELEVISION RECEIVER PERFORMANCE STANDARDS

### Inquiry

Federal Communications Commission.

ACTION: Notice of Inquiry Initiated.

SUMMARY: Inquiry into the need for television receiver performance standards. The objective of this proceeding is to determine what, if any, additional performance standards the Commission should impose on television receivers to insure that the overall quality of television reception is not degraded by the F.C.C.'s actions in Docket No. 21010. This Notice solicits public comment on various performance characteristics that describe the quality of picture and sound produced by television receivers.

DATES: Comments must be received by June 1, 1979 and Reply Comments must be received by September 1, 1979.

ADDRESSES: Secretary, Federal Communications Commission, Washington, D.C. 20554

FOR FURTHER INFORMATION CONTACT:

Hector Davis, FCC Laboratory Division, Laurel, MD 20145, (301) 725-1585.

Adopted: December 20, 1978.

Released: December 29, 1978.

In the matter of Television Receiver Performance Standards, GEN Docket No. 78-393.

### INTRODUCTION

1. The Federal Communications Commission (FCC) is initiating this Inquiry to investigate the need for television receiver performance standards in our rules.[1] UHF noise figure and peak picture sensitivity are the only requirements now in our rules that give some measure of the picture quality produced by the receiver. Noise figure is only one of many parameters that describe receiver performance. In this proceeding [2] we intend to examine

[1] Television receivers are now required to comply with Part 15 of the rules (47 CFR 15.61 *et seq.*) limiting the amount of spurious radiation from the local oscillators. In addition, the performance of the UHF portion of the receiver must meet several performance levels aimed at providing satisfactory UHF performance. Failure to meet these requirements would result in the denial of FCC certification, a prerequisite for sale of the receivers in this country.

[2] The FCC is taking several interrelated actions which we anticipate will improve television reception by the general public, and possibly have other benefits as well. Briefly, these actions are:

*Report and Order in Docket No. 21010, UHF Television Noise Figure*, FCC 78-582, 43 FR 36096 (August 15, 1978). This Order will change the Noise Figure standard to 12 dB by 1982.

*Notice of Inquiry in General Docket No. 78-307, Television Receiver Equipment Grading*, FCC 78-665, 43 FR 49550, (October 24, 1978). This Inquiry will explore ways to improve reception by increasing the amount of information available to consumers.

*Notice of Inquiry in General Docket No. 78-348, Measurement Techniques of Television Receiver Noise Figures*, FCC 78-737, 43 FR 51650 (November 6, 1978). This Docket

Footnotes continued on next page

it and other measures of evaluating weak signal performance. In addition, because optimizing weak signal performance may degrade other aspects of receiver performance, we intend to examine other receiver performance measures that complement noise figure when describing the overall performance of television receivers.

2. The use of noise figure as a measure of weak signal sensitivity was recently examined by the FCC's Laboratory Division.[3] The noise figures and apparent weak signal sensitivities of several different television receivers were measured. The data produced by this study suggested that noise figure did not consistently predict the apparent sensitivity of the receivers tested. This called into question the usefulness of noise figure as a measure of weak signal performance. As a result we intend to examined other available or technically feasible measures of television receiver weak signal performance with the objective of identifying alternative measures that could supersede the requirements now in our Rules.

3. In addition we wish to examine what performance standards might be adopted as complements to noise figure measurement as an indication of receiver sensitivity. The FCC recently decided in Docket No. 21010, to reduce the UHF noise figure standard in our Rules to 14 dB by 1979 and 12 dB by 1982.[4] During the panel discussion in this proceeding [5] concern was expressed by several parties, including the FCC's Chief Engineer, that achieving the mandated reduction in noise figure might lead to certain receiver design changes which would degrade other receiver performance characteristics (e.g. selectivity; front end dynamic range; etc.) It was feared that, as a result of competitive pressures, manufacturers might feel compelled to elect this solution. The new stricter noise figure standards might thus, inadvertantly, result in some television sets providing an overall poorer picture under some receiving conditions albeit with a better noise figure. To avoid this possibility the Commission will also consider additional performance standards complementary to noise figure.[6]

### Subjects To Be Addressed in This Inquiry

4. Comments are requested on the subjects listed below. When describing the usefulness of a particular performance measure, please include as much information as possible on the costs, benefits, and trade-offs involved in adopting the proposed measure. The effect of technology presently available, and anticipated on the basis of recognized trends, should be taken into account when analyzing the practicality of a proposal. Parameters which cannot be measured, or cannot be measured economically today, but that may become practical in the near future, should be considered. In addition, parameters of special importance to the performance of a receiver fed by a cable television system should be identified as such, and a supporting explanation should be given for its special relevance.

5. Subject 1. *Parameters to use in indicating weak signal performance.* When estimating specifications, please consider costs, benefits, trade-offs and present and probable technological trends. Information is requested regarding:

1-A. Noise figure (12 dB or less) modified to include other receiver characteristics such as bandwith, and impedance match.

1-B. Relative and/or absolute picture sensitivity.

1-C. Objective and/or subjective use of a signal to noise ratio (e.g., 30 dB, TASO 3 or other measures); and,

1-D. Other measures of weak signal performance.

6. Subject 2. *Receiver performance standards that describe the adequacy of reception.* (Please describe the interrelations of parameters as appropriate.)

2-A. Receiver selectivity, overall and interstage (e.g., effects on noise figure and interference rejection, changes with desired signal level to reduce receiver noise, in weak signals).

2-B. Dynamic range considerations (receiver overload protection, changes in interference rejection with desired signal level).

2-C. Interference rejection (e.g., specifications and measurements of rejection of out-of-band signals such as CB transmissions, adjacent TV channels, intermodulation, image, etc.).

2-D. Television receiver picture resolution standards (e.g. frequency response, "sharpness" control, focus, interlace, display linearity).

2-E. Color rendition by a receiver (e.g., an objective measure of color quality related to subjective observations, use of VIR signal circuitry, full bandwidth demodulation).

2-F. Receiver transient performance, that is, the ability of the receiver to handle abrupt picture transitions without smear, overshoot, or ringing.

2-G. Effect of circuit design on apparent noise (e.g. synchronous detector versus envelope detector, d.c. restorer, color or monochrome).

2-H. Receiver audio performance (e.g. frequency reponse, distortion, freedom from "buzz", etc.).

2-I. Receiver stability (e.g. change of performance parameters with such variables as vibration and movement, input supply voltage, length of time in service, and ambient temperature.

2-J. Cable television service characteristics (e.g., channel selection flexibility, protection from ambient non-cable signals, receiver input terminals).

2-K. Receiver performance indices (e.g. a number or numbers between 1 and 100 where 100 means "perfect" performance) based on each of the specific parameters previously discussed, and, in addition, the overall comparability of the UHF and VHF performance, the effectiveness of compensation for ghosts, the amount of overscan, vertical interval blanking, etc.

### Inquiry Procedures

7. *Who should file comments?* We urge television and test equipment manufacturers, engineering groups and all other interested parties to participate in this investigation. You may participate by sending information and opinions that are relevant to the subjects of this Inquiry.

8. *How will this information be used?* These comments will be used to evaluate the issues we have discussed above. We expect that the comments received will result in a refinement of the areas commented on leading to further notices of inquiry or proposals to adopt amendments to our Rules. For example, we might change the Rules to reflect the need for additional certification requirements in conjunction with the 1982 implementation of the 12 dB noise figure.

9. *How should comments be prepared?* Your comments must clearly show this docket number "GEN No. 78-393" on the first page. Please label your responses so that it will be clear

---

Footnotes continued from last page

will explore the definition of noise figure, methods for its measurement, and other related technical issues.

*Notice of Inquiry in General Docket No. 78-391, Improvements to UHF Television Reception,* FCC 78-864, elsewhere in Part III of this issue. This Inquiry will explore ways of bringing about better UHF reception and achieving UHF television reception parity or comparability.

*Notice of Inquiry in General Docket No. 78-392, Technical Improvements to Television Receivers and Certain Transmission Standards.* FCC 78-866, elsewhere in Part III of this issue. This Inquiry will explore technical improvements leading to the next generation of television receivers.

[3] *Relationship Between Noise Figures and Other Performance Characteristics of Contemporary UHF-TV Receivers,* L. C. Middlekamp et al., FCC/OCF LAB 78-02.

[4] *Report and Order in Docket No. 21010, UHF Television Noise Figure* FCC 78-582, 43 F.R. 36096 (August 15, 1978).

[5] *Notice of Panel Presentation,* 43 F.R. 15744 (April 4, 1978); *Procedure for Panel Presentation, 43 F.R. 19893 (May 9, 1978).*

[6] What we propose here is related to, but does not overlap with, our *Notice of Inquiry* on *Measurement Techniques of Television Receiver noise Figures,* in which we are examining improvements to the existing noise figure measurement technique. There we are examining short-term improvements: how can what we now require to be measured (the noise figure of the UHF tuner) be updated to reflect changes in circuit configuration—e.g. the change from hot filament vacuum tubes to solid state devices—and the availability of more sophisticated test equipment? Here we are looking beyond the existing noise figure characteristics, to a new definition of noise figure or a new weak signal performance standard altogether.

which subject is being addressed. If you have general comments which are not on a specific technical subject listed above, simply label these comments with the Docket number. Please state the issue being addressed. We encourage you to submit a one page summary of your comments at the time you file.

10. *How many copies should be sent?* Section 1.419 of the Rules requires that you file the original and five copies of your comments. If you want each Commissioner to receive a personal copy of your comments, you should include 6 additional copies. The FCC will consider all comments, even if only the original is filed.

11. *Where to send comments.* Send your comments to: Secretary, Federal Communications Commission, Washington, D.C. 20554. Comments must be received by June 1, 1979.

12. *How to see the comments of other parties.* All comments will be available for public inspection in the FCC Dockets Reference Room, Room 239, 1919 M Street, NW., Washington, D.C. The FCC is open weekdays between 8:00 am and 5:30 pm. You can reply to these comments by following the same procedure for preparing and sending comments. Replies to comments must be received by September 1, 1979.

13. Regarding questions on matters covered by this document, contact Hector Davis (301) 725-1585.

14. *The source of our legal authority.* Sections 4(i), 302, 303 (f), (g), (r), and (s), 330, and 403 of the Communications Act of 1934 as amended gives the FCC the authority to conduct this Inquiry. Accordingly, the FCC Orders that this Inquiry is instituted.

FEDERAL COMMUNICATIONS COMMISSION,
WILLIAM J. TRICARICO,
*Secretary.*

[FR Doc. 79-1506 Filed 1-16-79; 8:45 am]

---

**[6712-01-M]**

**[47 CFR Part 15]**

[General Docket No. 78-392; FCC 78-866]

## TECHNICAL IMPROVEMENTS TO TELEVISION RECEIVERS AND CERTAIN TRANSMITTER STANDARDS

### Inquiry

AGENCY: Federal Communications Commission.

ACTION: Notice of Inquiry.

SUMMARY: The FCC is soliciting the public for comments on the Texas Instruments TV receiver, other receiver improvements, and certain related transmitter characteristics. This information is needed to form the technical basis from which action may be taken to improve television reception.

DATES: Comments must be received on or before July 1, 1979, Reply Comments must be received on or before October 1, 1979.

ADDRESS: Federal Communications Commission, Washington, D.C. 20554.

FOR FURTHER INFORMATION CONTACT:

Will McGibbon, Office of Chief Engineer, Federal Communications Commission, Washington, D.C. 20554 (202-632-7060)

Adopted: December 20, 1978.

Released: December 29, 1978.

In the matter of technical improvements to television receivers and certain transmitter standards, Gen. Docket No. 78-392.

### INTRODUCTION

1. The Federal Communications Commission (FCC) is initiating this Inquiry to pursue the most economical way to improve television reception and to increase the utilization of the radio spectrum. We have taken several actions in the past to upgrade UHF television service to achieve eventual comparability with VHF television. We recently lowered the maximum receiver noise figure on UHF channels from 18 dB to 12dB—an action that will improve most receivers manufactured in the future.[1] Looking further ahead, we have attempted to stimulate the development of the next generation of television receivers. We believe that technological advances will allow dramatic improvements in receiver design. In this Inquiry, the Commission will investigate improvements in receiver design, and other related technical issues, with the aim of continuing the process of improving television reception.

2. On March 2, 1978, Texas Instruments, Inc. (T.I.), presented to the Commission a summary of their final report on FCC Contract No. 0206-6TQ, High Performance Television Receiver.[2] An FCC Laboratory Division report [3] evaluating the T.I. prototype receiver was also presented. Both reports are available from the National Technical Information Service (NTIS), Springfield, Virginia 22161 (Telephone 703/557-4650). The genesis of the T.I. contract was the Commission's belief that many or all of the UHF "taboos", adopted in 1952, could be eliminated by improved receiver design. The "taboos" arise from several different UHF television receiver technical limitations. A UHF TV receiver tuned to a specific UHF TV channel can receive interference from other nearby TV transmitters on certain channels, or from other receivers tuned to a different TV channel. The "taboo" channels have certain known frequency relationships to each desired channel.

3. In May 1975, we began Docket No. 20485, *UHF Taboos*,[4] to get public comments on the issue of taboo reduction or elimination. Less than a year later, in April 1976, the FCC formally solicited bids for the development of a television receiver having improved technical performance which might eliminate a majority of the taboos. No responsive proposals were received to this offer. In August 1976, we received an unsolicited proposal from Texas Instruments that addressed most of the improvements in our original solicitation. We then awarded a contract to T.I. which resulted in the development of a "high performance" television receiver (hereinafter the "T.I. receiver").

4. The proceeding we initiate today is the next step of this continuing and important effort. Because this broader inquiry into receiver characteristics incorporates Docket No. 20485, we are closing that Docket but will consider all comments filed therein as part of the record here. Since many of the issues addressed in Docket No. 21010

---

[1] The FCC is taking several interrelated actions, which we anticipate will result in improved television reception by the general public, and possibly other benefits. Briefly, these actions are:

*Report and Order in Docket No. 21010, UHF Television Noise Figure*, FCC 78-582, 43 FR 36096 (August 15, 1978). This order will change the Noise Figure standard to 12 dB by 1982.

*Notice of Inquiry in General Docket No. 78-307, Television Equipment Grading*, FCC 78-665, 43 FR 49550 (October 24, 1978). This Inquiry will explore ways to improve reception by increasing the amount of information available to consumers.

*Notice of Inquiry in General Docket No. 78-348, Measurement Techniques of Television Receiver Noise Figures*, FCC 78-737, 43 FR 51650 (August 15, 1978). This Inquiry will explore the definition of Noise Figure, methods for its measurement, and other technical related issues.

*Notice of Inquiry in General Docket No. 78-391, Improvements to UHF Television Reception*, FCC 78-864, elsewhere in Part III of this issue (December 20, 1978). This Inquiry will explore ways of bringing about better UHF reception and achieving UHF television parity.

*Notice of Inquiry in General Docket No. 78-393, Television Receiver Performance Standards*, FCC 78-868, elsewhere in Part III of this issue (December 20, 1978). This Inquiry will explore performance standards to use in conjunction with noise figures to insure overall television adequacy, and new measure of weak signal performance to supersede noise figure.

[2] *Final Report for High Performance TV Receiver*, D. L. Ash and C. S. Hartmann, Texas Instruments, Inc., FCC/OCE CE 78-01 (March, 1978) NTIS #PB 277186.

[3] *A Study of the Characteristics of the FCC Prototype TV Receiver Relative to Conventional Receiver UHF Taboos*, L. C. Middlekamp et al, FCC/OCE LAB 78-01 (February, 1978) NTIS #PB 277187.

[4] *Notice of Inquiry in Docket No. 20485*, 53 F.C.C. 2d 411 (1975).

are also pertinent to this Inquiry, we are incorporating herein all comments filed in that proceeding.

5. The improvements we are considering in this proceeding have the potential for providing better reception of existing UHF television signals and may permit the reduction of the UHF taboos. We believe that the reduction of the UHF taboos is of significant importance. Such a reduction can be expected to result in more efficient use of the spectrum. If there are spectrum savings, there are a variety of ways that spectrum thus saved may be used. For example, there may be the opportunity to create new TV stations, or we could put all or a portion in a "spectrum bank" to be drawn upon as needed rather than expended immediately. We also note that while reduction of the UHF taboos was the prime reason for our seeking a high performance receiver, the TI receiver may have improved performance at VHF as well. A new receiver may benefit the public by also increasing the flexibility of VHF channel assignments.

6. The work performed by Texas Instruments only addressed some of the changes that could be made in TV receiver design. Yet, the implementation of these changes would require a major redesign of future television receivers. When contemplating such a change, it is important that other possible improvements in receiver performance characteristics also be considered. Other possibilities include: improvements to audio quality, improvements to UHF picture quality, better receiver antenna performance, less picture ghosting, stereo TV sound, alternate sound channels with foreign language translations, and other technological advances so new, their potential has not yet been brought to the FCC's attention. Several desirable improvements, perhaps each by itself too costly to implement, might, when considered together, be the most appropriate option to elect. Failure to examine a valid possibility now might require a second, sequential change in any new receiver performance standards—a prospect costly to manufacturers and consumers. Case-by-case consideration of major technical receiver modifications may prevent or delay introduction of desirable improvements in receiver performance that would prove cost effective if incorporated in a redesign mandated for other reasons. Thus, it is appropriate to consider as many of those technical changes as possible at this time.

7. We have identified below a number of specific issues upon which the views of interested parties are solicited. We find it necessary to ask these questions in order to thoroughly consider all possible actions, but we stress that we have not prejudged any of the issues. In this particular Notice we are focusing on three areas:

(A) An evaluation of the technical design, potential benefits, and cost efficiency of the T.I. receiver;

(B) An evaluation of other possible changes in television receiver design; and

(C) An evaluation of possible changes in certain transmitter standards, and coverage protection criteria.[5] We recognize that, were we to adopt rules, many of the issues raised here could have a major impact on the manufacturers of television receivers, the television broadcast industry, and on the consumer.[6] We want to make it clear at the outset that we will not begin the rule amendment process until we have given all interested parties sufficient opportunity to contribute to our deliberations.

8. Although possible changes to the UHF television taboos are being addressed in this Notice, the Commission does not intend to address spectrum reallocation issues or the existing nationwide table of television assignments at this time. Allocation issues such as these are being reserved for future consideration since it is our intent in this Notice to focus upon specific technical and economic issues related to receiver design and transmission standards. The information developed in this Notice will form the foundation for consideration of broader issues in the future. Whether this inquiry is a step toward adoption of additional standards for TV receivers, a realignment of our table of television assignments, creation of a completely new television service based on a new generation of television receivers, or a combination of these measures, remains to be decided in a future proceeding.

9. We are also not addressing in this Notice more fundamental changes in the configuration of the television broadcast service (e.g., digital transmission, different picture aspect ratio, higher resolution pictures gained by increasing the number of lines in each frame and the scan time, or the use of new frequency compression techniques to save spectrum).[7] In limiting the scope of our Notice, we have assumed the continuation of the existing form of television service, and focus here on changes within the existing television service. While we recognize the existence and importance of these other matters, and intend to address them in a subsequent Notice, responses directed to these issues will be deemed unresponsive to this particular Notice.

### Summary of the TI Study

10. Texas Instruments, Inc., concluded that it is feasible to redesign television receivers to generally meet the performance standards set forth in the Commission's original Request for Proposals (RFP). T.I. demonstrated this by providing the Commission with the T.I. receiver, which appears to meet many of the the Commission's target performance standards. With respect to these standards, this receiver appears to be generally superior to conventional receivers, and may reduce the need for some of the UHF and VHF taboos.[8]

11. The T.I. study addressed the radio frequency (RF) system (including the VHF and UHF tuners) the intermediate frequency (IF) amplifier circuits, the demodulator, and the controller. The FCC supplied a "1976" model, electronically tuned, color TV set in which T.I. replaced the IF modules and the tuners. T.I. developed a new system architecture and several new RF components. T.I. indicated that the improved system performance depends on the new devices and new circuits used in the converted TV receiver. T.I. referred to the RF system as a "pure IF" tuning system. The key devices in it are the steep selectivity, low loss, 346 MHz IF surface-acoustic wave (SAW) filters and the low noise, wide dynamic range silicon MESFET (metal Schottky field effect transistor) devices. T.I. claimed one advantage of the high (346 MHz) first IF is that some of the UHF spurious responses, such as picture image, sound image, half-IF, and IF-beat, are greatly reduced. T.I. discussed several other potential benefits of their redesign.

12. T.I. felt that the key cost elements of the new system would be the silicon MESFETs, the low-loss UHF SAW IF filters, and the SAW frequency control resonators. None of these parts are currently mass produced. A significant imvestment of effort and money would be necessary to develop

---

[5] There are important trade-offs between these possible changes and improvements in receiver design. We hope that some of these questions can be resolved quickly, because these changes could be implemented prior to a major receiver redesign.

[6] This Inquiry covers many technical issues which may greatly affect the public. It may become necessary to issue a subsequent NOI to determine opinion and interest from the consumer's point of view.

[7] Many alternatives to the present transmission standards and receiver designs were considered by the National Television Systems Committee (NTSC) (*See Report and Order in Docket No. 10637, Amendment to the Commission's Rules Governing Color Television Transmission,* (41 F.C.C. 658, 10 R.R. 150 (1953)) and the Television Allocations Study Organization (*See Engineering Aspects of Television Allocations,* (March 16, 1959), Wallace Homestead Books, 1912 Grand Ave., Des Moines, IA, 50309). These alternatives may be of interest because of the numerous technological advances that have been made since they were last considered by the Commission.

[8] *See* the Table in Paragraph 15 below.

the production process for these items. Receiver cost may also increase because the T.I. prototype uses about 10% more electronic component parts than a conventional tuner would. This increase in the number of component parts may not be significant, they note, because much of the circuitry could be replaced or reduced by special integrated circuits and more careful production design.

13. With the new devices and a higher number of electronic components, T.I. projected a semiconductor parts cost for the new receiver of approximately $13.00 as compared to $4.90 for a conventional receiver. They also projected a slight increased in other material costs and a decrease in labor and overhead costs. T.I.'s estimates assumed that 1.5 million units had already been produced, and that manufacturers would therefore be out of the production startup phase. T.I. concluded that at this point the increased cost of manufacturing the tuner would be about $9.00, and the increased cost to the consumer would be about $30.00 for an average color television.

14. The FCC Laboratory evaluated the performance of the prototype receiver using video and audio program material from three television channels. These signals were converted to various combinations of UHF channels to test the T.I. receiver (and a control receiver) for susceptibility to various types of interference. Three FCC engineers were used to make subjective observations of interference at the "barely perceptible level." According to the FCC Laboratory, the T.I. receiver appears to perform generally better than the stock receiver used as a control. For some types of interference, however, the FCC Laboratory found that the T.I. receiver did not meet all of the specifications set forth in the Commission's original RFP. The Laboratory report notes that some of the interference subsceptibility of the T.I. receiver may have resulted from the use of electronic (varactor) tuning.

15. The following summary of the T.I. receiver performance was prepared by the Commission's Laboratory Division, and is quoted directly from the Laboratory Division Report referred to above in note 3, paragraph 2:

PROTOTYPE RECEIVER'S PERFORMANCE

| UHF "Taboos" | re FCC RFP | re TI Projections | re Stock Rcvr | re Mean Conv Rcvr |
|---|---|---|---|---|
| Adjacent Channel: | | | | |
| n, n+1 | Slightly better | Worse | Much better | Much better |
| n, n−1 | Better | Slight better | Much better | Much better |
| Picture Image: | | | | |
| n, n+15* | Much better | Much better | Much better | Much better |
| Sound Image: | | | | |
| n, n+14* | Much better | Much better | Much better | Much better |
| Cross Modulation: | | | | |
| n, n+2 | Worse | Worse | Much better | Better |
| n, n−2 | Worse | Worse | Much better | Better |
| n, n+4** | Much better | Better | Much better | Much better |
| n, n−4 | Much better | Better | Much better | Better |
| Intermodulation: | | | | |
| n, n+2, n+4 | Worse | Much worse | Much better | Equal |
| n, n−2, n−4 | Worse | Much worse | Better | Worse |
| IF Beat: | | | | |
| n+8* | Much worse | Worse | Much better | Much worse |
| n−8* | Much worse | Equal | Much better | Worse |
| n+7* | Equal | Better | Much better | Better |
| n−7* | Worse | Slightly better | Much better | Better |
| Input for Noise-Equivalent: "TASO Grade 3"***. | Worse | | Better | Equal |
| Noise Figure**** | Worse | Worse | Worse | |

NOTES: * The prototype receiver has a much higher IF than a conventional receiver, therefore, these "taboo" combinations apply only to conventional receivers. Effects of the new IF are under study.

** For a conventional receiver, n+4 gives rise to a "half-IF" beat phenomenom. The different IF of the prototype translates this condition to higher channel separations and is under study.

*** This is not a UHF "taboo."

**** Although not a UHF "taboo," a performance specification was made. However, doubt exists as to the applicability of noise figure measurements to complete TV receivers.

QUESTIONS TO BE ADDRESSED IN THIS INQUIRY

16. Technical Issues Raised by the T.I. receiver.

QUESTION 1: If receiver performance standards based on the results of the T.I. study were adopted:

(1a) Are there reasons why the additional cost to the consumer would not average approximately $30.00 as projected by T.I? Would this estimate apply to black and white sets?

(1b) If the cost of a TV receiver increased or reception improved, what would be the effect on the demand for TV receivers?

(1c) What would be the effect on receiver manufacturers and on the structure of the receiver manufacturing industry?

(1d) To what extent would these standards be achieved in production television receivers?

(1e) To what extent could the taboo distances be reduced, for:

(1e-1) Intermodulation?

(1e-2) IF Beat?

(1e-3) Sound Image?

(1e-4) Picture Image?

(1e-5) Local Oscillator Radiation?

(1e-6) Adjacent Channel (VHF and UHF)?

(1f) If the adjacent channel taboo were essentially eliminated, under what conditions could co-location or near co-location of transmitters then be used to reduce the intermodulation problems? What problems would be generated in co-locating or near co-locating transmitters?

(1g) Would there be a better choice of local oscillators and intermediate frequencies than T.I.'s, some of which are in a portion of the spectrum allocated to Government use?

(1g-1) What new taboos would a receiver using the T.I. intermediate and local oscillator frequencies require?

(1g-2) How could any problems created by TI's local oscillators and intermediate frequencies be alleviated (e.g. by requiring stricter chassis radiation standards)?

(1g–3) What problems would other recommended local oscillators and intermediate frequencies cause?

(1h) What impact would the mandated changes have on a receiver designed to utilize the mid- and superband frequencies between 108–136 MHz and 225–400 MHz (i.e. a "cable compatable" receiver) for viewing of cable television service according to the specifications in Docket No. 21006? [9]

QUESTION 2: Are there alternatives to the T.I. receiver design which would achieve the Commission's goals, as outlined in paragraph 1? If so:

(2a) Would these receiver design changes require different receiver performance standards than the T.I. receiver? If so, describe the standards required.

(2b) What would be the benefits of these changes?

(2c) How much would these design changes add to the purchase price of television receivers?

(2d) How would these design changes affect the cable compatibility of future television receivers?

17. Other Improvements to Television Reception

QUESTION 3: What potential improvements in current receiver performance or design are foreclosed by current transmitter performance (e.g. would reduced incidental phase modulation allow greater use of synchronous detectors)?

(3a) What would be the costs, benefits and trade-offs of implementing these improvements?

(3b) How would these improvements impact on cable television systems and receivers connected to cable systems?

QUESTION 4: Should the Commission require minimum audio performance standards for receivers?

(4a) What audio bandwidth should be specified?

(4b) What distortion standards should be specified?

(4c) What other audio standards should be specified?

(4d) What provisions if any, should the Commission require for the reception of alternate aural channels (e.g. Spanish translations of popular programs, reception of stereo broadcasts, augmented audio for the blind, or educational uses) [10]

(4e) What would be the affect on cost if these standards were adopted?

QUESTION 5: In the context of a complete TV receiver design, would it be in the public interest to allow manufacturers to make receivers which did not receive channels 70 through 83? [11]

(5a) What opportunities would such action offer for improving receiver performance?

(5b) How would the cost of receivers be affected?

(5c) What would be the impact on UHF TV translator operators and their viewing public?

QUESTION 6: Describe the impact of electronic tuning [12] in the following areas:

(6a) To what extent will electronic tuning affect the noise figure and interference susceptibility of the receiver?

(6b) How much would the cost of receivers change if the Commission required electronic tuning?

(6c) Would the demand for television receivers be affected if the Commission required electronic tuning?

(6d) What tuner specifications would best promote comparability of VHF and UHF reception?

(6e) On receivers with automatic tuning systems that include automatic channel loading mechanisms [13] what manner of loading and minimum number of channel positions should be made a precondition for certification.[14]

(6f) What problem would be encountered by cable systems and cable subscribers if the Commission were to require TV receivers to be electronically tuned?

QUESTION 7: In the context of a total receiver redesign, mandated for other reason, what would be the incremental cost and the additional changes necessary to make such a receiver "off-air cable compatible"? [15]

(7a) What would be the incremental cost of requiring such newly redesigned receivers to be easily convertable to off-air cable compatability?

(7b) How do these incremental costs compare to the cost of a converter to:

(7b–1) the individual cable viewer;

(7b–2) the Nation as a whole, considering all cable viewers and all television purchasers.

QUESTION 8: Should accessible (but not necessarily exterior) test terminals be required as part of the receiver for any certification or grading program? If so, what performance characteristics should be measurable through the test terminals? [16]

QUESTION 9: Concerning Vertical Interval Reference (VIR): [17]

(9a) Should the Commission require the transmission of the VIR signal by all televisions stations?

(9b) Should the Commission require receivers to have the capability of using the VIR signal for automatic receiver color adjustments?

QUESTION 10: Can the present 1.25 MHz bandwidth provided for the vestigial sideband of the visual portion of

---

[9] *See Notice of Proposed Rule Making in Docket 21006*, 61 FCC 2d, 1022 (released December 8, 1976) and *Report and Order in Docket 21006*, 65 FCC 2d 813 (released August 8, 1977).

[10] We note that the question of specifying transmission standards for these possible additions to the television broadcast service is being considered in Docket No. 21323. *See, Use of Subcarrier Frequencies in Aural Base Band*, FCC 77-477, 42 F.R. 38606 (July 15, 1977).

[11] *First Report and Order, in Docket No. 18262*, 19 R.R. 2d 1663 (1970), the FCC reallocated UHF channels 70–83 to the land mobile radio services, but allowed existing translators to operate on a secondary basis. *See also Memorandum, Opinion and Order*, 25, F.C.C. 2d 764, 20 R.R. 2d 1512 (1970).

[12] In a companion order, to be issued today we are terminating Docket No. 21179, *UHF Channel Readout on Television Receivers* (*Notice of Inquiry*, FCC 77-221, 42 FR 18643 (April 8, 1977)). The extensive changes we are considering in this and several related proceedings (*see supra* note 1) supersede the issues raised by Docket No. 21179, making it inappropriate to pursue this line of inquiry further.

[13] The FCC has recently received requests to grant certification of a TV receiver system which has a number of electronically preset positions (similar to the selectors in push button car radios) which can be programmed to automatically tune to particular stations. In addition, this system can automatically scan the TV frequencies in an area, and assign each selector position a station. If there are a greater number of stations in the area than preset positions, some stations will be excluded. The total number of preset positions (and the preference for automatic systems to load from the top down or bottom up) therefore potentially puts stations at one end of the televison band or the other at a significant disadvantage, even though the viewer can change the preset channels. The FCC could require, for example, that a particular ratio of UHF and VHF stations be selected, or that the positions be loaded with UHF stations first.

[14] The current minimum number of preset positions required for certification is eleven. 47 C.F.R. 15.68 (b)(1) (1976).

NOTE: cable systems serving 3500 or more subscribers are required to have at least 120 MHz of bandwidth (the equivalent of 20 television channels) for immediate or potential use. 47 C.F.R. 76.252(a)(1).

[15] For a detailed description of a cable-compatible receiver, *see* (1) EIA-Cable Television System Committee (CTSC) (Draft of) Engineering Bulletin of Cable-TV Receiver and System Standards (November 8, 1973) and (2) Panel #-3, C-TAC Report available from the U.S. Department of Commerce, National Technical Information Service, PB-247, 810, Springfield, Va., 22151.

[16] *See, Notice of Inquiry General Docket No. 78-307, Television Equipment Grading*, FCC 78-665, 43 F.R. 49550 (October 24, 1978). *See also, Notice of Inquiry in General Docket* No. 78-393, *Television Receiver Performance Standards*, FCC 78-868, elsewhere in Part III of this issue (December 20, 1978).

[17] The FCC Rules allow the VIR signal to be added to the program signal at the point where its color characteristics are established, and to accompany the program signal as it traverses all circuits to the output of the transmitter. The VIR signal is constructed so that circuit distortions responsible for color deterioration will ordinarily cause measureable changes in the standardized VIR signal. Measurement of the distortion in the VIR signal allows corrections to be made to the signal. This is primarily used to correct distortions before transmission. Presently, some home TV receivers are capable of using this same information to automatically adjust color. Docket 19907, FCC 74-1234, 49 F.C.C. 2d 884, 31 R.R. 2d 1505 (1974).

the television signal be reduced in view of recent filter and phase equalization developments? If so:

(10a) What new circuitry would be required in television receivers?

(10b) What would be the impact on the performance and cost of television receivers?

QUESTION 11: Current television transmission standards prohibit use of lines 1-16 in the vertical blanking interval for purposes other than receiver synchronization because of reciever limitations. Lines 17-21 may be used for other specified purposes, (such as test signals, VIR, etc).

(11a) To what extent will current technology permit reduction in the number of lines needed for synchronization?

(11b) What would be the added cost, if any, in receivers?

QUESTION 12: Present day television transmissions in accordance with FCC Standards [18] contain 4.2 MHz of luminance information and 1.5 and 0.5 Mhz of color information (in-phase and quadrature color signals respectively). A number of the current receivers do not use all of this information, some of them using as little as 3 MHz of bandwith for liminance information and 1 Mhz for color information.

Given the state of the art:

(12a) What improvements in picture fidelity, acuity and color clarity could be achieved with existing transmission bandwidths?

(12b) What changes in receiver design would be necessary to achieve these improvements?

(12c) Would these changes result in any change in cost to the consumer? I so, how much?

(12d) In what ways would these changes affect the demand for television receivers?

(12e) To what degree would improved quality in television receivers require different practices by the broadcaster (e.g. better aperture correction in cameras or different luminance bandwidth roll-off in color cameras)?

QUESTION 13: The lack of accessible input and output jacks to the video and audio amplifiers of television receivers necessitates utilization of RF devices in video games, video tape recorders, and other equipment that use the home TV as a video display unit. This increases the cost of such items, and increases the probability of electromagnetic interference to other electronic equipment. Should such video and audio jacks be required for certification of TV receivers? If so, what associated technical standards should be established? What would be the cost of these changes?

QUESTION 14: What improvements to receiver design are possible to alleviate picture ghosting? How much would these improvements cost?

QUESTION 15: To what degree should the FCC specify the dynamic range for TV receivers to reduce front end overloading? How much cost would be added to receivers if the FCC adopted these standards?

QUESTION 16: If the FCC finds that some of the changes in receiver design described above would be in the public interest:

(16a) Would any or all of these improvements be likely to occur in the next five years if no Commission rule making action is taken in this regard?

(16b) What courses of actions should the Commission consider taking to promote implementation of these changes?

(16c) Are there particular courses of action which would be harmful or most beneficial?

QUESTION 17: What should the Commission's performance standards be for the transmission line between the antenna terminals and the tuner (e.g. should shielded co-axial cable be required)?

18. Possible changes in transmitter standards and coverage protection criteria.

QUESTION 18: Should the FCC consider requiring minimum antenna heights and coverages, or increases in the minimum effective radiated power (ERP) requirements?[19] If so, what values would be appropriate?

QUESTION 19: In what way should protection criteria for assignments reflect actual ERP, antenna heights, and coverage areas? (e.g. creating classes of lower power TV stations such as those that exist in the FM radio broadcast service)?

QUESTION 20: How can the FCC's protection criteria for assignments reflect the use of directional antennas?

QUESTION 21: Should television stations be required to use precise frequency control,[20] and how should the FCC's protection criteria for assignments reflect such use?

(21a) How would this affect the cost of TV transmitter equipment?

(21b) What would be the potential benefits of such a requirement?

QUESTION 22: The FCC's rules require that the aural transmitter power be 10-20% (7-10 dB) of the visual carrier transmitter power.[21] If the FCC required an even lower aural transmitter power level:

(22a) What would be the effect on reception with current receivers? [22]

(22b) What would be the effect on reception if new performance standards (e.g. based on the TI study) were adopted?

(22c) What would be the effect on television broadcast costs?

(22d) What changes in television protection criteria should be made to reflect the changes in reception?

(22e) Would there be any improvements in adjacent channel reception if the aural carrier power was reduced?

### Information on Comments

19. *Who should file comments?* We urge television equipment manufacturers, broadcasters, the viewing public, and all other interested parties to participate in this Inquiry. You may participate by sending information and opinions that are relevant to the questions listed in this Inquiry.

20. *How will this information be used?* These comments will be used to evaluate the issues we have discussed above. We expect that some comments will lead us to propose specific rule changes, and that some comments may lead to further Notice of Inquiry. For example, a second Notices of Inquiry may be necessary to determine the opinions and equipment preferences of the viewing public. The FCC will make rule changes only after all interested parties are given an adequate opportunity to comment.

21. *How comments should be prepared.* Your comments must clearly show this docket number "General Docket No. 78-392" on the first page. Please lable your responses so that it will be clear which number question is being answered. If your comments are general and do not address a specific question, please state the issue being addressed. We encourage you to submit a one page summary of your comments at the time you file.

---

[18] The FCC adopted the NTSC Standards as part of its Rules in Docket No. 10637, 41 F.C.C. 658, 10 R.R. 1501 (1953). A summary of the NTSC standards appears in Appendix A of this Docket, 41 F.C.C. 675, at 10 R.R. at 1518.

[19] The present Rules allow UHF television stations to use maximum radiated powers of 5000 kW (37 dBk) at antenna heights above average terrain of 2000 feet. A survey made by the FCC Office of Chief Engineer in 1974 showed that relatively few UHF stations operated near the limits, *Antenna and Power Statistics of TV Stations in the U.S.*, J. C. H. Wang, FCC/OCE RS 76-02 (1976).

[20] Present television transmitter frequency tolerance is 1kHz. If television stations were required to control the transmit frequency more precisely, to within a few Hertz, interference could be decreased, and service area increased. Precise Frequency Control (PFC) is now used voluntarily by some VHF stations to reduce average co-channel interference by about 6dB. It is not used at UHF, as it is not now needed (since there is little if any co-channel interference on UHF). UHF television stations are generally noise limited rather than interference limited. If UHF assignments were to be made on an interference-limited basis, which took into account actual power and antenna heights PFC for UHF might be useful.

[21] 47 C.F.R. 73.682 (a)(15).

[22] *See*, Dean, Charles E, "Measurements of the Subjective Efforts of Interference in Television Reception," *Proceedings of the IRE* (June 1960) at 1040.

22. *How many copies should be sent?* Sec. 1.419 of the rules requires that you file the original and five copies of your comments. If you want each Commissioner to receive a personal copy of your comments, you should include 6 additional copies. The FCC will fully consider all comments, even if only the original is filed.

23. *Where to send comments:* Send your comments to: Secretary, Federal Communications Commission, Washington, D.C. 20554.

24. *How to see the comments of other parties.* All comments will be available for public inspection in the FCC Dockets Reference Room, Room 239, 1919 M St., NW. Washington, D.C. The FCC is open weekdays between 8:00 am and 5:30 pm on weekdays. You can reply to these comments by following the same procedure as you would for commenting.

25. Regarding questions on matters covered by this document, contact Will McGibbon (202) 632-7060.

26. *Deadline for filing Comments.* Comments must be received by July 1, 1979. Replies to comments must be received by October 1, 1979.

27. *The source of our legal authority.* Sections 4(i), 302, 303(f), (g), (r) and (s), 330, and 403 of the Communications Act of 1934, as amended gives the FCC the authority to conduct this Inquiry. Accordingly, the FCC orders that this Inquiry is instituted. The FCC further orders that the records from Docket Nos. 20485 and 21010 be included in this proceeding, and that Docket No. 20485 is terminated.

FEDERAL COMMUNICATIONS COMMISSION,
WILLIAM J. TRICARICO,
*Secretary.*

[FR Doc. 79-1505 Filed 1-16-79; 8:45 am]

*Advance Orders are now Being Accepted for Delivery in About 6 Weeks*

# CODE OF FEDERAL REGULATIONS

## (Revised as of July 1, 1978)

| Quantity | Volume | Price | Amount |
|---|---|---|---|
| _____ | Title 29—Labor (Parts 500 to 1899) | $6.25 | $_____ |
| _____ | Title 29—Labor (Parts 1900 to 1919) | 7.00 | _____ |
| _____ | Title 32—National Defense (Parts 590 to 699) | 4.50 | _____ |
| _____ | Title 32—National Defense (Parts 800 to 999) | 5.50 | _____ |
| _____ | Title 32A—National Defense, Appendix | 4.00 | _____ |
| | | Total Order | $_____ |

*[A Cumulative checklist of CFR issuances for 1978 appears in the first issue of the Federal Register each month under Title 1. In addition, a checklist of current CFR volumes, comprising a complete CFR set, appears each month in the LSA (List of CFR Sections Affected)]*

*PLEASE DO NOT DETACH*

**MAIL ORDER FORM** To:

Superintendent of Documents, Government Printing Office, Washington, D.C. 20402

*Enclosed find $..... (check or money order) or charge to my Deposit Account No. .....*

*Please send me ..... copies of:*

PLEASE FILL IN MAILING LABEL BELOW

Name _____

Street address _____

City and State _____ ZIP Code _____

| FOR USE OF SUPT. DOCS. |
|---|
| ____Enclosed____ |
| To be mailed later____ |
| ____Subscription____ |
| Refund____ |
| Postage____ |
| Foreign Handling____ |

FOR PROMPT SHIPMENT, PLEASE PRINT OR TYPE ADDRESS ON LABEL BELOW, INCLUDING YOUR ZIP CODE

SUPERINTENDENT OF DOCUMENTS
U.S. GOVERNMENT PRINTING OFFICE
WASHINGTON, D.C. 20402

OFFICIAL BUSINESS

POSTAGE AND FEES PAID
U.S. GOVERNMENT PRINTING OFFICE
375
SPECIAL FOURTH-CLASS RATE BOOK

Name _____

Street address _____

City and State _____ ZIP Code _____